GRADING BARLEY
at Country Points

Barley is used mainly for livestock and poultry feed. In recent years, however, about one-third of the crop has been used for malt, and some also has been used for making pearled barley. Premiums over the feed prices are paid for barley that can be used for these industrial purposes.

On the market, barley is bought and sold by grade. The market grades are **No. 1, No. 2, No. 3, No. 4, No. 5, and Sample** grades. The white barley grown west of the Great Plains area is known as Western Barley.

In judging whether barley is suitable for feeding, malting, or pearling, certain tests are used by grain inspectors and others. (These tests also are made by grain inspectors in grading barley.) This pamphlet describes some of these tests and shows how they can be made at country points. Seven steps are commonly used in judging barley for feed, and a few more in judging barley for malting or pearling. The usual steps taken are:

1. Sampling.—Take a fair and average sample of the barley to be tested, using a grain probe.

2. Condition.—Smell the sample and examine it carefully. Musty or sour barley or barley having an odor of hides, oil, or fertilizer is undesirable for feeding or for industrial uses. Barley that is heating or hot is also considered to be low in quality. Such barley belongs in the Sample grade. When barley is infested with live weevils or other insects that injure grain, it is classified as Weevily.

3. Dockage.—Good feed barley should be clean, and barley used for malting or pearling must be cleaned before it is processed. Grain inspectors clean barley samples with screens or sieves (fig. 1), and the material removed is known as dockage. Dockage may consist of fine material such as weed seeds and dirt, or of coarse material such as sticks and unthreshed barley heads.

The fine material is removed by a sieve with small triangular holes (the small buckwheat sieve). Coarse material is removed by a scalper sieve or riddle, through which the barley falls, leaving the coarse dockage material on top. Dockage also includes undeveloped, shriveled, or small pieces of barley kernels removed in the screening process that cannot be saved by rescreening with a small buckwheat sieve. The dockage test usually is made with a dockage machine

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fitted with the proper screen and riddle, but the test can be made with hand sieves.

The percentage of dockage is determined by weight. This means that a balance is needed for weighing the sample before it is cleaned and the dockage removed. If dockage content is less than 1 percent, it is disregarded, but if it is 1 percent or more, a statement to that effect is added to the grade, as "No. 1 Barley; dockage, 2 percent." When barley is sold by grade on the market, the seller ordinarily is not paid for dockage.

4. Moisture.—After a wet harvest, the moisture content of barley should be checked carefully, as damp barley will not keep in storage. Grades No. 1 to No. 5 grown east of the Rocky Mountains may contain not to exceed 14.5 percent of moisture. Any of these grades carry the notation "Tough" when they contain more than 14.5 percent, but not more than 16 percent of moisture. If the moisture content exceeds 16 percent, the barley is graded as Sample grade.

Western Barley grading No. 1 to No. 5 may contain not to exceed 13.5 percent of moisture. When it contains more than 13.5 percent but not more than 15 percent of moisture, it carries the notation "Tough." When the moisture content of Western Barley exceeds 15 percent, the barley is graded as Sample grade.

Grain inspectors and many country grain dealers test for water content with moisture machines. Many farmers obtain moisture tests of hand-threshed samples of standing barley before starting to harvest.

5. Test weight.—Good barley is plump and heavy. A brass quart measure and beam are used in making the weight test.

6. Sound barley and broken kernels.—The quantity of sound barley in a sample is an important grading factor. The percentage of sound barley is 100 less the total of other grains, wild oats, foreign material, and all damaged barley. This determination is made by hand picking at least a 30-gram portion of dockage-free barley (fig. 2). This same portion may be used for determining broken kernels, but broken kernels, unless otherwise damaged, are considered sound barley (fig. 3, top).

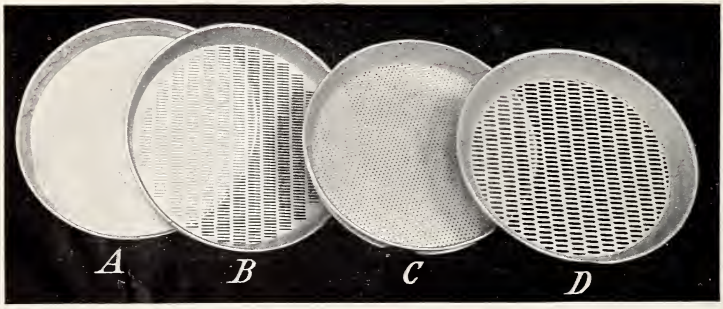

FIGURE 1.—Barley sieves (left to right): *A*, Bottom pan; *B*, sizing sieve, 47/64- by ¾-inch perforations; *C*, small buckwheat sieve, 5/64-inch diameter-inscribed circle; *D*, scalper sieve, 9/64- by ¾-inch.

FIGURE 2.—Hand picking a sample to determine percentage of sound barley.

7. Objectionable foreign matter.—Feeders of barley are further protected through the provisions that stones and cinders in eastern barley and hard clay particles (adobe), stones, cinders, and the unhulled seeds of wild bromegrass in Western Barley all tend to grade the barley down to sample grade.

FIGURE 3.—Broken kernels (top) and skinned kernels (bottom).

8. Pearling test.—Damp or wet barley stored for any length of time is likely to heat in the bin and may become heat-damaged in the process. Heat-damaged kernels can best be detected in the pearled sample. About 50 grams of dockage-free barley is placed in a pearling machine (fig. 4) and the percentage of heat damage is determined on a portion of the pearled sample. Heat-damaged kernels of pearled barley (fig. 5, left) are reddish brown and are easily distinguished from the sound kernels (fig. 5, right).

The pearling test is also used to determine mellowness, which is particularly desirable in malting barley. Mellowness refers to starchiness. All white and gray-colored kernels that appear to be 10-percent or more starchy in texture are classified as Mel-

FIGURE 4.—A barley pearler.

low. Green or blue kernels should be at least 50-percent starchy in texture to classify as Mellow.

9. Skinned and broken barley.—Broken kernels, discussed under item 6, is a grade factor. However, when barley is used for malting purposes, not only is the broken barley a grade factor, but also the skinned barley. A skinned kernel of barley has at least one-third of the husk removed or has the husk loosened or removed over the germ (fig. 3, bottom). When the skinned and broken kernels exceed 5 percent, the barley cannot classify as Malting Barley.

To make this test for Malting Barley, a portion of about 30 grams of dockage-free barley is taken; the skinned and broken kernels are separated by hand and weighed and the percentage is computed. Skinning and breaking are usually caused by close threshing, or sometimes by rough handling through loading devices. Farmers who hope to sell their barley for malting purposes must use care not to skin or break the kernels. The test-weight requirements are low enough to make it unnecessary to thresh good barley closely to get the required test weight.

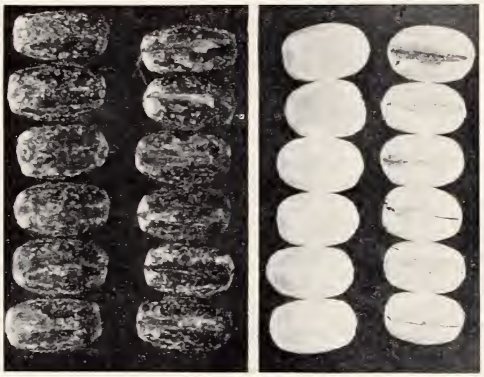

FIGURE 5.—Heat-damaged barley (left) and sound barley (right), after pearling. (Univ. Minn.)

FIGURE 6.—Making a sizing test.

10. Kernel size.—Before barley is malted, the kernels are sized. The thin kernels are not used for malting purposes. Grain inspectors make a sieving test, using a 20-gage metal sieve with slotted perforations 0.076 (4⅞/64) of an inch wide and ¾ inch long (fig. 1, *B*). In this test about 1⅛ quarts of the dockage-free barley is sieved, and the barley is not classified as Malting Barley if the thin barley and other material that passes through the sieve exceeds 15 percent. About one-third of the portion tested is placed on the sieve, and the sieve is moved from side to side steadily so that the barley moves 30 times left to right across it (fig. 6).

11. Blighted barley.—Because of the danger of introducing molds in the malting

process, barley is not classified in the Malting subclass if it contains more than 4 percent damaged barley of any description. One of the common forms of damage in barley is known as scab or blight (fig. 7, right). Some types of scabby or blighted barley are not suitable for hog feed. To identify disease-infected barley properly, any barley that contains more than 4 percent of kernels damaged or materially discolored by blight or mold is classified as Blighted.

12. Two-rowed and six-rowed barley.—Both two-rowed and six-rowed varieties of barley are used for malting purposes. But mixtures of these barleys are not wanted by maltsters. In the malting process barley is soaked in water, sprouted evenly, and then dried. Mixtures of two-rowed and six-rowed barley may introduce varieties that absorb water at different rates of speed and do not all sprout at the same time. All this causes difficulties in the malting process and produces a malt that is not uniform.

The following paragraphs tell how to distinguish between two-rowed and six-rowed barley:

FIGURE 7.—Sound kernels (left) and blight-damaged kernels (right). (Univ. Minn.)

In the Field

In the head, the two classes of barley are easily identified (fig. 8).

The spikelet of six-rowed barley (fig. 9, left) consists of three kernels. The two lateral kernels of each spikelet show a definite twist of about one-quarter turn. The middle kernel does not have this twist and resembles a two-rowed kernel (fig. 9, right) in this respect.

In the Threshed Grain

In the threshed grain six-rowed barley is indicated by the presence of lateral kernels that have the characteristic twist. In two-rowed barley, kernels with this twist are absent (fig. 10).

The middle kernel of the spikelet in six-rowed barley is not

FIGURE 8.—*A*, Two-rowed barley: Flat side (left) and edge (right); *B*, six-rowed barley.

FIGURE 9.—Spikelet of six-rowed barley with three kernels (left); only one kernel in a spikelet of two-rowed barley (right).

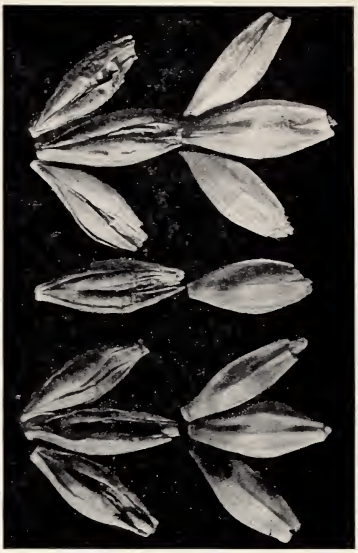

FIGURE 10.—Threshed kernels of six-rowed and two-rowed barley. The kernels of six-rowed barley have been reassembled in threes. (Univ. Minn.)

twisted, but can be distinguished from two-rowed by other characteristics. Six-rowed kernels are ridged or convex on the back, and the back appears to be arched when viewed from the side (fig. 11, top). Two-rowed kernels are flat on the back, as shown by the side and cross-section views in figure 11, bottom.

The germ end of two-rowed kernels is more wedge-shaped than that of the six-rowed middle kernels. Six-rowed kernels are slightly incurving on each side of the germ end, while the two-rowed are straight-sided. From the crease view, two-rowed kernels usually have deeper and wider creases and appear to be plumper than the six-rowed kernels.

A careful study of figures 9, 10, and 11 and of kernels from barley heads of six- and two-rowed varieties should bring out the differences between the two types of barley.

To determine the percentage of two-rowed or six-rowed barley in any sample, approximately 30 grams of dockage-free barley is obtained and the separation is made by hand.

13. Variety mixtures in Malting Barley.—Because of differences in the way varieties of barley malt, any variety mixture is objectionable, especially mixtures of hard and flinty barley with those that are soft or mellow. Sometimes in the pearled sample, the hard and flinty varieties can be distinguished from the softer varieties. There are also external characteristics by which the experienced grader is able to differentiate between the varieties. One of these characteristics is a smooth or rough beard. Another is the character of the rachilla,

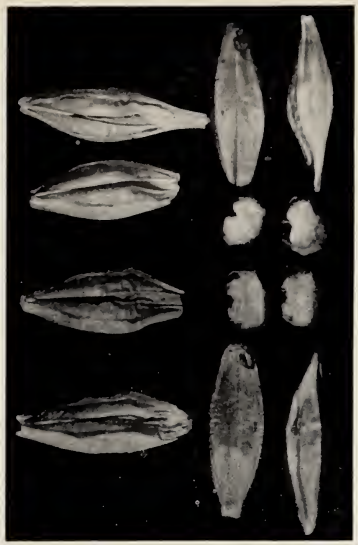

FIGURE 11.—Six-rowed barley (top) and two-rowed barley (bottom). (Univ. Minn.)

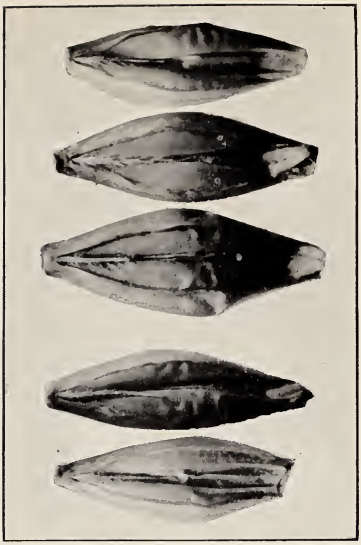

FIGURE 12.—Long-haired rachillae—three kernels at top; short-haired rachillae—two kernels at bottom. (Univ. Minn.)

a small plant structure found on the creased side of the kernel (fig. 12).

Details of the grading of barley can be obtained from any licensed grain inspector or Federal grain supervisor located in the markets where grain is inspected and graded.

References

For complete standards, see:

COMBS, W. B., AND SMITH, F. G. GRAIN GRADING PRIMER. U. S. Dept. Agr. Misc. Pub. 325, 48 pp., illus. 1940. Revised.

ABERG, E., AND WIEBE, G. A. CLASSIFICATION OF BARLEY VARIETIES GROWN IN THE UNITED STATES AND CANADA IN 1945. U. S. Dept. Agr. Tech. Bul. 907, 190 pp., illus. 1946.

TABLE 1.—*Grade requirements for barley grown east of the Rocky Mountains*

Class I.—Barley and Class II.—Black Barley

Grade requirements for subclass Malting Barley and subclass Barley of the class Barley, and for the class Black Barley

Grade No.	Minimum limits of—		Maximum limits of—			
	Test weight per bushel	Sound barley [1]	Heat-damaged kernels (barley, other grains, and wild oats)	Foreign material	Broken kernels	Black barley [2]
	Lbs.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1 [3]	47	95	0.1	1	4	0.5
2 [3]	46	93	.2	2	8	1.0
3 [3]	43	90	.5	3	12	2.0
4 [4]	40	80	1.0	4	20	5.0
5	35	70	3.0	6	30	10.0
Sample grade	Sample grade shall include barley of the subclass Barley, or of the class Black Barley, which does not come within the grade requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 16 percent of moisture; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.					

[1] Any barley in grade No. 1 that does not come within the provisions of the special grade Blighted, may contain not more than 2 percent of blight-damaged barley; and barley in any grade from No. 2 to Sample grade, inclusive, that does not come within the provisions of the special grade Blighted, may contain not more than 4 percent of blight-damaged barley. Any barley containing more than 4 percent of blight-damaged barley shall be graded No. 1, No. 2, No. 3, No. 4, No. 5, or Sample grade, Blighted, as the case may be, as provided in the specifications for Blighted barley.

[2] These specifications do not apply to the class Black Barley.

[3] See special requirements for subclass Malting Barley.

[4] Barley that is badly stained or materially weathered, shall not be graded higher than No. 4.

Requirements for Malting Barley, subclass A

This subclass shall include six-rowed barley of the class Barley (Class I) which meets the requirements of grades Nos. 1 to 3, inclusive, which, after the removal of dockage, contains not more than 5 percent of two-rowed and/or other types or varieties of barley of unsuitable malting type such as Trebi and Black; which contains not more than 15 percent of barley and other matter that will pass through a 20-gage metal sieve with slotted perforations 0.076 (4⅝ 64) of an inch wide and ¾ of an inch long; which contains not more than 5 percent of skinned and/or broken kernels; which contains not more than 4 percent of damaged barley; and shall not include Bleached barley. Barley of this subclass shall contain 75 percent or more of mellow barley kernels which kernels are not, en masse, semisteely.

TABLE 2.—*Grade requirements for Western Barley, Class III*

[*This class shall include white (glumes) barley grown west of the Great Plains area of the United States, and may include not more than 10 percent of barley of other classes.*]

Grade No.	Minimum limits of sound barley	Maximum limits of—				
		Heat-damaged kernels (barley, other grains, and wild oats)	Wild oats	Foreign material	Broken kernels	Black barley
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
1	98	0.1	1	0.5	3	0.5
2	96	.2	2	1.0	6	1.0
3	93	.3	3	2.0	10	2.0
4	88	.5	5	3.0	15	5.0
5	80	1.0	10	4.0	25	10.0
Sample grade	Sample grade shall include barley of the class Western Barley which does not come within the grade requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 15 percent of moisture; or which contains inseparable adobe, stones, and cinders, singly or combined; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which contains the seeds of wild bromegrasses of a character and in a quantity sufficient to cause the grain to be of low quality for feeding purposes; or which is otherwise of distinctly low quality.					

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